REMARKS

Claims 1-14 are pending in the present application. Claims 7, 8 and 14 are currently amended. No new matter has been entered as a result of the present amendments.

Claims 1-14 are in condition for allowance. Notice thereof is respectfully requested.

Specification

The specification is objected to because the abstract is not on a separate page following the claims. A page comprising just the title and a page comprising just the abstract is included herein for substitution in the specification.

The disclosure is objected to due to a cited informality on page 9. Applicants have reviewed the document and the listed informality is not apparent. Clarification or withdrawal is requested.

Claim Rejections - 35 USC § 112, second paragraph

Claims 7 and 8 are rejected under 35 U.S.C. 112, second paragraph, as being unclear. This has been traversed by amendment.

Claim 5 is rejected under 35 U.S.C. § 112, second paragraph for being dependent upon rejected claim 6. This rejection is unclear since claim 5 is rejected elsewhere in

the Official Action. Applicants are unable to respond to this rejection due to the lack of clarity in the action. Clarification or withdrawal of the rejection is requested.

Double Patenting Rejection

Claims 1-14 are provisionally rejected under the judicially created doctrine of double patenting over claims 1-13 of co-pending Application No. 10/054,243.

Claims 1-3, 6-8 and 10-14 are provisionally rejected under the judicially created doctrine of double patenting over later filed claims 1, 4, 6-8 and 10-11 of co-pending Application No. 10/054,014.

A terminal disclaimer is filed herewith thereby traversing the double patenting rejection.

Claim Rejections - 35 USC § 103(a)

Claims 1-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wehrmann US Pub 2002/011701 in view of US 6,379,583 to Gray et al.

Wehrmann is cited as disclosing a method for manufacturing a thin film inorganic light emitting diode. As indicated by the Office Wehrmann fails to disclose ZnS doped with a luminescent center by precipitation form appropriate aqueous solution comprising zinc ions, sulfide ions and dopant

ions and washing dispersions of doped ZnS to remove non-precipitated ions.

Gray is incorrectly cited as teaching those elements lacking in the primary disclosure by Wehrmann. The technique of Gray is not a precipitation technique, as set forth in the claimed invention but is instead a two phase system wherein one phase is a bicontinuous cubic phase and the other phase is a solution. The formation of a doped ZnS occurs by some undescribed phenomenon involving the interior surface of the bicontinuous cubic phase and reactants which enter therein. The present invention is specific to an aqueous precipitation wherein all reactants are brought together to form a doped ZnS.

Col. 4 lines 1-7 of Gray are cited as forming a precipitation from an aqueous phase. This disclosure is taken out of context based on the teachings of the present invention. The disclosure describes a process wherein the reactants are maintained in an aqueous phase below a reaction temperature to prohibit precipitation until the bicontinuous cubic phase can be added into the solution. The reactants then diffuse into the interior of the bicontinuous cubic phase for reaction to occur. It is clear from the teachings of Gray that precipitation directly from aqueous solution is undesirable.

Gray col

It is only in hindsight, based on the present application, that the teachings of Gray would be considered and then critical elements ignored to reach a finding of unpatentability. If the teachings of Gray are followed precipitation from aqueous solution is to be avoided. This is contrary to the present claimed invention.

In making the present rejection the Office has considered Wehrmann, which does not teach doped ZnS, and combined this reference with Gray, which teaches away from precipitation in aqueous solution. The present invention is directed to a doped ZnS, prepared by precipitation directly from aqueous solution. This rejection can only be made in hindsight which is improper.

Furthermore, the preparation of the doped ZnS nanoparticles, according to Gray et al., requires a combination of surfactant and liquid hydrophilic phase at any ratio that produces a bicontinuous cubic phase, whereas in the method for manufacturing doped ZnS, according to the method of the present invention, no surfactant is required. This represents an unexpected simplification of the process according to Gray et al. neither indicated nor hinted at in Gray et al. Therefore, the process for preparing doped ZnS nanoparticles disclosed in present claim 1 differs from, and is inventive over, that disclosed in Gray et al. The doped

ZnS prepared according to the present invention also differs from that prepared according to Gray et al. Evidence for this contention is provided by particle size measurements carried out on the doped ZnS nanoparticles prepared according to the present invention, as exemplified at page 14, line 16, to page 15, line 4, of the present specification wherein stated is:

"The dispersion was analysed for its particle size distribution (weight average d_{wa}) with the Disc Centrifuge Photosedimentometer Brookhaven BI-DCP. A weight average particle size diameter of about 75 nm was obtained.

Although particle sizes could be measured with DCP, no clear particles could be visualized by Electron Microscopy (SEM, TEM). The measured particle sizes are probably due (as revealed by EM images) to aggregates of nano-sized particles[6]. This is further confirmed by the fact that ultrasonic treatment before the DCP measurement clearly influences the obtained particle size distribution. The longer the time between the ultrasonic treatment and the DCP-measurement, the larger the obtained values for the weight average particle size. Also the polydispersity increases.

XRD-measurements indicate low crystalline ZnS, however the obtained diffraction signal was used in the Debye-Scherrer equation to calculate the crystalline particle size. Depending on the precipitation conditions, particle sizes between 1.5 and 5 nm were found.

Another indication that the primary particles are indeed much smaller as revealed by DCP-measurements, is the fact that the absorption edge of the ZnS-dispersion and/or layer shifts to shorter wavelengths if compared with bulk ZnS (~ 330 nm). This is a well known phenomenon in quantum dots[7]. Depending on the precipitation conditions, values of the absorption edge for the ZnS dispersions or layers between 275 and 310 nm were found, indicating, according to the Brus equation[19], particle sizes between 1.5 and 5 nm."

The present specification further discloses electroluminescence of Cu-doped ZnS, according to the present invention, at 490 nm at page 20, line 29, and electroluminescence of Mn-doped ZnS, according to the present invention, at 590 nm at page 23, lines 5 and 20. Gray et al. discloses Mn-doped ZnS nanoparticles with a photoluminescence emission peak of 590 nm (see figure 2) and copper-doped ZnS

with green emission, but provides no evidence of their electroluminescent properties. Gray at col. 7, lines 12-15, merely discloses that:

> "Another unique advantage of the nanoparticles according to the present invention is that they are not only photoluminescent but can also be cathodoluminescent and electroluminescent."

This indicates that doped ZnS according to the preparation process disclosed in Gray et al. is not necessarily electroluminescent, whereas doped ZnS prepared according to the process, according to the present invention, exhibits electroluminescent properties.

The combination of teachings of Wehrmann et al. and Gray et al. does not produce the method for manufacturing a Thin Film Inorganic Light Emitting Diode device of claim 1, the claims dependent thereon, or the Thin Film Inorganic Light Emitting Diode device of amended claim 14. Furthermore, the invention of claim 1 and the claims dependent thereon and amended claim 14 can not be adduced therefrom.

CONCLUSIONS

Claims 1-14 are pending in the present application. All claims are in condition for allowance. A notice of allowance for claims 1-14 is respectfully requested.

Respectfully submitted,

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